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Notes:

1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]

- [Claim 1] High-strength concrete with which cement, a high-range water reducing agent or a high-performance AE water-reducing agent, a fine aggregate, coarse aggregate, a contraction reduction agent, and/or an expansive additive are contained, and water / cement ratio is characterized by compressive strength being 60Ns/mm² or more at 40 or less weight %.
- [Claim 2] High-strength concrete according to claim 1 with which a contraction reduction agent / cement ratio is characterized by 0.5 to 2.0 weight %, and/or an expansive additive / cement ratio being 1 to 10 weight %.
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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to high-strength concrete especially with a small brittleness index (compressive strength/tensile strength) about the high-strength concrete whose compressive strength is 60Ns/mm² or more.

[0002]

[Description of the Prior Art] The tendency of super-high-rise-izing of the viewpoint of much more effective use of land to a building and large-scale-izing is becoming still more remarkable in recent years. In order to realize such a super-high-rise or large-scale building, development of high-strength concrete which discovers the compressive strength of 60Ns/mm² or more is performed conventionally.

[0003]

[Problem(s) to be Solved by the Invention] Conventionally, with high-strength concrete, increase a cement content per unit volume of concrete using ordinary portland cement (for example, 500kg/m³ or more), and a high-range water reducing agent or a high-performance AE water-reducing agent is used. The compressive strength of 60Ns/mm² or more is made to discover by what (for example, 40 or less weight %) is decreased in water / cement ratio. However, in the high-strength concrete which carried out in this way and was prepared, the technical problem that a brittleness index (compressive strength/tensile strength) became large occurred.

[0004]

[Means for Solving the Problem] In order to solve said technical problem, as a result of inquiring

wholeheartedly, even if compressive strength is high-strength concrete of 60Ns/mm² or more by adding a specific material, this invention person etc. acquires the knowledge that a brittleness index (compressive strength/tensile strength) can be made small, and completes this invention.

[0005] That is, this invention contains cement, a high-range water reducing agent or a high-performance AE water-reducing agent, a fine aggregate, coarse aggregate, a contraction reduction agent, and/or an expansive additive, water / cement ratio is 40 or less weight %, and compressive strength is the high-strength concrete (Claim 1) which is 60Ns/mm² or more. Furthermore, contraction reduction agent / cement ratio of this invention are the high-strength concretes (Claim 2) according to claim 1 0.5 to 2.0 weight %, and/or whose expansive additives / cement ratios are 1 to 10 weight %.

[0006]

[Embodiment of the Invention] This invention is explained in detail hereafter. The high-strength concrete of this invention contains cement, a high-range water reducing agent or a high-performance AE water-reducing agent, a fine aggregate, coarse aggregate, a contraction reduction agent, and/or an expansive additive, water / cement ratio is 40 or less weight %, and compressive strength is a thing of 60Ns/mm² or more. In order that the amounts of fine particles of compressive strength, such as cement, may increase and it may secure the workability of this concrete in high-strength concrete of 60Ns/mm² or more, to some extent an lot of amount of water is needed. Therefore, it is possible that the cure time of the paste part in concrete becomes large, and the stress (accumulation stress) of **** accumulated in concrete by aggregate restraint becomes large. In this invention, by using a contraction reduction agent and/or an expansive additive, this accumulation stress decreases and a brittleness index is imagined to become small.

[0007] In the high-strength concrete of this invention, as cement Usually Various Portland cement, such as - high-early-strength and moderate heat Portland cement, Various blended cement, such as Portland-blast-furnace-cement fly ash cement, and the cement which used wastes, such as municipal solid waste incineration ash and raw sludge incinerated ash, as a raw material (ecocement), The cement which furthermore replaced some of said Portland cement and ecocement by chemical admixtures, such as limestone powder, silica fume, and metakaolin, is mentioned. As a fine aggregate, river sand, an inland sand, sea sand, crushed sand, and these mixtures can be used. As coarse aggregate, a river gravel, a pit gravel, a sea gravel, crushed stones, and these mixtures can be used. As a high-range water reducing agent or a high-performance AE water-reducing agent, the high-range water reducing agent or high-performance AE water-reducing agent of a lignin system, a naphthalene sulfonic acid system, a melamine system, and a polycarboxylic acid system can be used.

[0008] In the high-strength concrete of this invention, as for water / cement ratio, 40 or less weight % is desirable, and its 20 to 35 weight % is more desirable. When water / cement ratio exceeds 40 weight %, it becomes difficult to make the compressive strength of 60Ns/mm² or more discover, and it stops meeting the purpose of the invention in this application of offering high-strength concrete. Water / cement ratio becomes concrete which the workability of concrete gets worse rapidly and is hard to deal with it and is not desirable at less than 20 weight %. In addition, as for a cement content per unit volume of concrete, in this invention, it is desirable to consider it as 500-700kg/m³. It becomes difficult to make the compressive strength of 60Ns/mm² or more discover, and a cement content per unit volume of concrete stops meeting the purpose of the invention in this application of offering high-strength concrete, in less than 500kg/m³. If a cement content per unit volume of concrete exceeds 700kg/m³, the viscosity of concrete will become high and workability will fall. Moreover, a temperature crack becomes

easy to produce and is not desirable. Moreover, as for the amount of a high-range water reducing agent or the high-performance AE water-reducing agent used, it is desirable to consider it as 0.5 to 3.0 weight % by the high-range water reducing agent or the high-performance AE water-reducing agent / cement ratio, and it is more desirable to consider it as 0.7 to 2.0 weight %. a high-range water reducing agent or a high-performance AE water-reducing agent / cement ratio -- less than 0.5 weight % -- water / cement ratio -- good concrete of workability is hard to be obtained at 40 or less weight %. Even if a high-range water reducing agent or a high-performance AE water-reducing agent / cement ratio exceeds 3.0 weight %, on ***, the effect serves as leveling off and is not desirable from a point of cost. Moreover, from the workability of concrete etc., in this invention, as for a sand-total aggregate ratio, it is desirable to consider it as 46 to 55%, and it is more desirable. [47 to 53% of]

[0009] In the high-strength concrete of this invention, a contraction reduction agent has the desirable alkylene oxide addition product of the lower alcohol which has the operation which dissolves in water and falls the surface tension, and is shown by chemical formula;RO(AO) nH. Here, R in a formula is the alkyl group of carbon numbers 4-6. As such a group, a n-butyl machine, iso-butyl, tert-butyl, n-pentyl group, an iso-pentyl group, a tert-pentyl group, etc. are mentioned. Moreover, A in a formula is one sort or two sorts of alkylene groups of carbon numbers 2-3, and ethylene and/or a propylene machine are mentioned. Furthermore, n in a formula is the integer of 1-10. RO (AO) [a thing desirable in the alkylene oxide addition product of the lower alcohol shown by nH] It is the propylene oxide (addition number of moles 2)/ethyleneoxide of n-butyl alcohol (addition number of moles 3), and "AS21" by Taiheiyo Cement Corp. is mentioned as a commercial item. As for a contraction reduction agent, it is desirable to use it, replacing with some kneading water. As for the amount of the contraction reduction agent used, 0.5 to 2.0 weight % is desirable at a contraction reduction agent / cement ratio, and its 0.7 to 2.0 weight % is more desirable. A contraction reduction agent / cement ratio does not become large and have a desirable brittleness index at less than 0.5 weight %. Since coagulation delay will arise and cost will also become high if a contraction reduction agent / cement ratio exceeds 2.0 weight %, it is not desirable.

[0010] As an expansive additive, a calcium SARUHOARUMINETO system expansive additive, a lime system expansive additive, etc. are mentioned, and it can use both the heat-of-hydration inhibition type for mass communications, and usual type. Although the grain size of an expansive additive is not limited, a Blaine's specific surface area of 2000-6000cm²/g grade is desirable. As for the amount of the expansive additive used, 1 to 10 weight % is desirable at an expansive additive / cement ratio, and its 2 to 8 weight % is more desirable. An expansive additive / cement ratio does not become large and have a desirable brittleness index at less than 1 weight %. When an expansive additive / cement ratio exceeds 10 weight %, there is a case where it stops meeting in the purpose of the invention in this application of offering the high-strength concrete which expanding quantity is [high-strength concrete] too large, and hardness may fall [high-strength concrete], and makes the compressive strength of 60Ns/mm² or more discovering.

[0011] In this invention, using together a contraction reduction agent and an expansive additive does not interfere. As for the amount of the contraction reduction agent in this case, and the expansive additive used, it is desirable to consider it as the amount of the above-mentioned range used, respectively.

[0012] It is the conventional method and what is necessary is to limit neither the kneading method of the high-strength concrete of this invention, nor kneading equipment in particular, and just to knead it by a conventional mixer. Moreover, the care-of-health method in particular is not limited, either, and what is

necessary is just to recuperate itself by the conventional method. In addition, in this invention, the concrete admixture currently used from the former, such as an air-entraining agent and a defoaming agent, can be added within convenient limits if needed.

[0013] The example of an examination explains this invention hereafter.

1. The material shown below in use material was used.

1) Cement; ordinary portland cement by Taiheiyo Cement Corp. was used.

2) High-performance AE water-reducing agent; "core flaw CP-300" by Taiheiyo Cement Corp. was used.

3) Fine aggregate; the inland sand from SHIZUOKA PREFECTURE (specific gravity in saturated surface-dry condition: 2.60) was used.

4) Coarse aggregate; the crushed stone from Ibaragi Prefecture (specific gravity in saturated surface-dry condition: 2.64) was used.

5) Expansive additive; "ASANOJIPUKARU" by Taiheiyo Cement Corp. was used.

6) Contraction reduction agent; "AS21" by Taiheiyo Cement Corp. was used.

7) Water; tap water was used.

[0014] 2. Combination of concrete and the kneading aforementioned material were used, and concrete was prepared according to the combination shown in Table 1. Kneading was kneaded for 180 seconds using the double spindle forced action mixer (0.06m³).

[0015]

[Table 1]

No	コンクリートの配合 (kg/m ³)						
	セメント	細骨材	粗骨材	水	高性能AE 減水剤	膨張材	収縮 低減剤
1	5 8 3	7 9 4	8 3 2	1 6 9	7 . 5 8	—	6
2	5 5 3	7 9 4	8 3 2	1 7 5	7 . 5 8	3 0	—
3	5 5 3	7 9 4	8 3 2	1 6 9	7 . 5 8	3 0	6
4	5 8 3	7 9 4	8 3 2	1 7 5	7 . 5 8	—	—

[0016] 3. Evaluation above-mentioned each concrete was fabricated using the phi10x20cm mold and the phi15x30cm mold. It recuperated itself and unmolded within the mold for one day after shaping. Then, to predetermined age (7 or 28 days), carry out underwater curing and according to "JIS A 1108 (compressive strength test method of concrete)" [compressive strength (specimen use of phi10x20cm)] According to "JIS A 1113 (splitting-tensile-strength test method of concrete)", tensile strength (specimen use of phi15x30cm) was measured, and the brittleness index (compressive strength/tensile strength) was computed. The result is shown in Table 2.

[0017]

[Table 2]

No	材 令 7 日		材 令 28 日	
	圧縮強度 (N/mm ²)	脆度係数	圧縮強度 (N/mm ²)	脆度係数
1	73 . 5	15 . 0	85 . 0	15 . 8
2	81 . 3	14 . 8	84 . 1	15 . 0
3	75 . 0	12 . 5	82 . 7	14 . 0
4	81 . 5	16 . 3	91 . 1	17 . 2

[0018] The brittleness index was small, even if compressive strength was 73-85Ns/mm² in the high-strength concrete (examples 1-3 of an examination) of this invention containing a contraction reduction agent and/or an expansive additive so that clearly from Table 2. With concrete of the example 4 of an examination which, on the other hand, does not contain a contraction reduction agent and/or an expansive additive, the brittleness index was large.

[0019]

[Effect of the Invention] A brittleness index is small even if compressive strength is 60Ns/mm² or more in the high-strength concrete of this invention, as explained above.

[Translation done.]